HISTORIA MATHEMATICA 2 (1975), 59-66

PROJECTS

This department welcomes brief notes and article-length manuscripts. The former may include announcements of contemplated or ongoing projects, information on doctoral theses in progress or completed (writer, title, institution, supervisor, and available information on completion time), proposals and questions, and requests for assistance. Announcements of individual research projects, including theses, are very important to avoid awkward and wasteful duplication of effort. Articles will ordinarily describe projected, in process, or completed large-scale projects involving one or several scholars and should follow the same standards as other articles. They will be abstracted and indexed like other articles, and authors will be supplied with free reprints.

The journal especially welcomes descriptions of the preparation of editions of selected or collected works, manuscript collections, and correspondence; large-scale historical studies of subjects, countries, institutions, or collections of source material; comprehensive bibliographies; biographical and historical reference works; and multi-volume publications. Articles may describe aims, history (including related work by predecessors), present state of plans, including such matters as personnel, organization, publication plans, finances, related projects not undertaken, and so on. Most valuable would be detailed discussion of examples of historiographical, interpretative, and documentary difficulties.

A PROPOSED "MINI-STUDY" OF MATHEMATICAL DEVELOPMENTS*

By Saunders Mac Lane, University of Chicago

[The CBMS *Newsletter* is indebted to Professor Saunders Mac Lane, who is both President of the American Mathematical Society and Vice-President of the National Academy of Sciences, for the outline below of a "mini-study" of the long-run development of mathematical ideas that has recently been proposed to the Academy's Committee on Science and Public Policy (COSPUP).--Ed.]

In recent years many fields of science have carried out extensive, many-volume surveys of the state and prospect of

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their science. It now appears likely that future such studies will be much smaller, focussed on specific problems and called "Mini-Studies." Here we outline a possible mini-study in mathematics.

A. The Proposal

This study would be intended to clarify for other scientists and the public at large the meaning and use of mathematics by examining the development of quantitative and qualitative mathematical concepts, their interrelations, their applications to other sciences, and to the world in general. To this end, the study would examine a selected list of particular mathematical concepts, describing how they arose, and how they fitted (or how they might fit) with other parts of mathematics or with other sciences.

A report on the mathematical sciences is clearly more difficult than on some other sciences, partly because mathematics is both a science in itself and a tool for other sciences, and partly because the products of mathematics are not always visible. They usually affect the national welfare at second or third hand, but the effects are surely there.

Mathematics is now passing through an exceptionally fruitful period. The first half of this Century was a time when many deep abstract notions were developed, especially in algebra, topology, and functional analysis. Today we have an impressive synthesis in which the boundaries separating algebra, analysis, applied mathematics, geometry and number theory have been broken down by many advances depending essentially on the interpenetration of ideas. A new generation of mathematicians is much more alert to the possibility of adopting new techniques from unexpected sources. Ideas from the applications have enriched mathematics proper, as for instance in the notion of a distribution arising from electromagnetic theory and the Dirac delta function, as well as the development of singular pertubation theory from Prandtl's boundary layer ideas. More developments are in the wind. Even in fields of application where exact mathematical formulations are not yet possible, applied mathematicians have developed penetrating and appropriate numerical techniques for getting dependable answers, while at the same time ideas from pure mathematics have proved effective in the application. For example, some of the methods of global analysis discovered in the last 10 years have been used to obtain new results in statistical mechanics (understanding of relative equilibria), electric circuit theory, differential equations for non-linear circuits, and mathematical economics (results of Pareto optimization).

B. The Product

This mini-study would aim to prepare a volume of from 200 to

300 pages consisting of from 8 to 10 commissioned articles introduced by a keynote chapter. Each article would deal with a particular mathematical idea or development, and would examine this idea in sufficient detail so that its character and import would be clear to scientists in general. Possibly some articles might carry a technical appendix, but the articles themselves would not be technical. A more broadly written keynote chapter would summarize the individual articles and draw conclusions about the character and variety of the development of mathematics.

In addition to this volume there might be one or more summary articles, separately published, and aimed at quite general audiences: Secondary school teachers of all subjects, parents, and officials. For example, these articles might be more general versions of certain of the articles in the main volume.

The topics of individual articles would range widely over mathematics. For example, there could be discussions of particular topics in applied mathematics, including abstract ideas which developed out of the applications and what became of them. There could also be discussions of purely internal mathematical developments, such as ideas which arose within mathematics for conceptual reasons, but which later led to effective applications.

C. Purpose

The intent of this study is to clarify in some measure the nature and future of mathematics. At present, much of mathematics tends to be quite remote from the other sciences; though this cannot be wholly changed, it might be modified by a better formulation of the nature of current mathematical activities, designed for the information both of other scientists and of mathematical scientists, whatever their specialized interests.

In 1968, COSPUP sponsored a report, "The Mathematical Sciences: A Report" by the Committee on Support of Research in the Mathematical Sciences (COSRIMS). This report was written to meet very different and more expansive circumstances, and to cover a much wider set of objectives, including questions about manpower and education. Hence, the mini-study proposed should be an appropriate and much needed supplement to the earlier COSPUP report and its fine essay volume.

The preliminary plans for this Mini-Study have been considered by a Joint Committee organized by the Mathematical Association of America and the American Mathematical Society with the cooperation and participation of the Society of Industrial and Applied Mathematics. Suggestions for topics and chapters in the Mini-Study are welcome; they may be sent to Professor Ralph Boas (Northwestern University), Chairman of the Joint Committee, or to myself.